



United Nations  
Educational, Scientific and  
Cultural Organization



International  
Hydrological  
Programme



Flanders  
State of the Art

# MANAGING WATER RESOURCES IN ARID & SEMI-ARID REGIONS OF LATIN AMERICA & THE CARIBBEAN



## COORDINATION

### INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP)

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# INTRODUCTION

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Within the framework of Global Network on Water and Development Information for Arid lands (G-WADI), the International Hydrological Programme (IHP) launched the Managing Water Resources in Arid and Semi-Arid regions of Latin America and the Caribbean (MWAR-LAC) project in 2012, with the funding support made available by Flanders-UNESCO Science Trust Fund (FUST). It contributes to IHP-VIII “Water security Responses to Local, Regional and Global Challenges (2014-2021) providing sound scientific knowledge to reduce vulnerability and to improve the quality of live of local communities in arid and semi-arid environments in Latin America and the Caribbean.

The proposed activities are implemented in partnership with the Water Centre for Arid and Semi-arid Zones of Latin America and the Caribbean (CAZALAC) – a UNESCO Category-II Centre – acting as G-WADI Latin America and the Caribbean regional technical secretariat.



## MISSION STATEMENT

The project aims to improve the quality of life of local communities in arid and semi-arid environments in Latin America and the Caribbean, through a reduction of the vulnerability of water resource systems to global changes and an improvement in water governance based on sound scientific knowledge.



# OBJECTIVES

1

**INCREASE WATER GOVERNANCE TO ATTAIN INTEGRATED WATER RESOURCES MANAGEMENT** by supporting local and regional programs and supplying relevant scientific information to support decision making processes.

2

**INCLUDE CLIMATE INFORMATION IN WATER MANAGEMENT** by supporting local and regional projects aimed at generating and disseminating climate information systems for water management decision making.

3

**SUPPORT THE USE OF MODERN TECHNIQUES AND METHODOLOGIES** to assess and improve water use efficiency by building technical, academic and professional capacities.

## PARTICIPATING INSTITUTIONS & LINKAGES

- + **International Research Institute for Climate and Society (IRI)**, Earth Institute, Columbia University
- + **International Center for Integrated Water Resources Management (ICIWaRM)** – UNESCO Cat-II Centre, U.S.
- + **Water Center for Arid and Semi-Arid Zones in Latin America and the Caribbean (CAZALAC)** UNESCO Cat-II Centre, la Serena, Chile
- + **Princeton University**, US
- + **Center for Hydrometeorology and Remote Sensing (CHRS)**, University of California, Irvine, US
- + **G-WADI.org**

## PARTICIPATING COUNTRIES

Countries of Latin America and the Caribbean (LAC).



# THE CONTEXT

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Arid regions – including hyper-arid, arid, semi-arid and sub-humid regions – cover more than 18% of the Earth's surface and are considered the most vulnerable areas regarding the water crisis, particularly in Latin America, Asia and Sub-Saharan Africa, where underdeveloped countries are located. These regions face the greatest pressures in their limited freshwater resources and this is set to increase. In fact, in the 1990s 40% of the world's population suffered from serious water shortages and by 2025, two thirds of the population will face the threat of living under high water stress. Challenges faced by water managers in arid regions include population growth, food security, salinity increases and pollution from various sources. Moreover, climate change is expected to increase water scarcity and the frequency of extreme conditions, potentially threatening poor countries with major setbacks due to more frequent hydrologic disasters such as floods and droughts. In addition, the potential for conflict over water scarcity is higher in arid regions.

In this context, managing water is one of the greatest and most urgent challenges and to do so, accurate assessment of the available and renewable water resources is essential. However, such an assessment is especially difficult in arid regions: the science base is limited, data are scarce and humid zone experience is inappropriate. Therefore, improved scientific understanding, co-operation and data sharing are fundamental to facilitate ways of better water governance and reach integrated management of water resources in arid and semi-arid regions.

# ACTIVITIES

## STRENGTHENING OF DROUGHT MANAGEMENT CAPACITIES IN LATIN AMERICA AND THE CARIBBEAN

The occurrence of drought hazards has seen a significant increase in the Region of Latin America and the Caribbean, affecting over 60 million people over the last decades (EM-DATA, 2015). Mitigating the impacts of drought is a top priority of many governments in the LAC region, in order to move away from reactive crisis management and work towards pro-active climate risk management. This requires insight into the causes and characteristics of drought events and its processes, in order to identify the vulnerability of livelihoods to drought hazards.

The project works on two parallel lines of action. First, a network of regional specialists was consolidated into the Community of Practice on Drought Management to deal with drought and desertification issues in the Region. The Community of Practice encourages dialogue and collaboration as a means to inform and accelerate the development and use of effective drought information tools. The Community enables all members of the group to share information and experiences with each other, providing members with an opportunity to exchange knowledge. It also creates an agenda to support students and researchers to identify new topics of research, connecting individuals

from around the world and allowing them to work together on topics of similar interest.

To support the community, a database of drought specialists, their publications, projects and events in Latin America was developed. This database draws attention to current developments in the drought expert community in the region, and enhances collaboration between the different initiatives.

The second line of action focuses on the development of effective drought monitoring and early warning systems to increase national drought management capacities at the regional, national and watershed level. In close collaboration with national governments and their governmental agencies dealing with drought issues, a set of pilot national drought observatories are currently under development in Chile, Peru and Honduras. At the regional level, the Latin American and Caribbean Flood and Drought Monitor was launched to identify current and future flood and drought hazards occurring in the Region.

## THE CHILEAN DROUGHT OBSERVATORY: A CASE STUDY

The MWAR-LAC project supports the Unit for Agricultural Emergency (UNEA) of the Chilean Ministry of Agriculture, with the development of an Agroclimatic Observatory. The system allows decision makers, farmer communities and scientists to count with reliable, timely and actionable information on meteorological, hydrological and agricultural drought conditions, as well as an outlook on the upcoming season. This Observatory unlocks national datasets by involving all relevant local data and complements with international data sources.



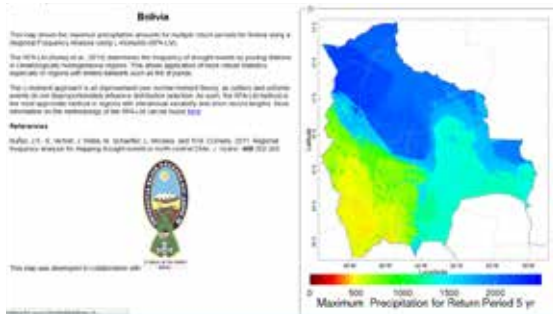
## THE LATIN AMERICAN AND CARIBBEAN DROUGHT ATLAS

The Drought Atlas for Latin America and the Caribbean enables identification of the vulnerability of livelihoods to drought hazards by providing an effective tool to raise awareness on their exposure to drought. The Atlas identifies the variability of rainfall deficits in countries in Latin America and the Caribbean and allows visualization of how this climatic variability differs spatially within countries, even within short distances. This is achieved by identifying the drought frequency which is the probability of drought occurrence with a certain magnitude and duration at any given place in the area of interest.



Specific deliverables focus on vulnerability maps for precipitation deficit (drought) and excess, and identify flood risks in vulnerable areas.

Additionally, the atlas can be used to support decisions for drought risk management, answering the following questions: “How rare is the current drought? “What will be the magnitude of the drought we are planning for?”, and “How rare is the drought of record?”



Specifically, the activities focus on capacity building of early-career professionals on the application of Near Term Climate Change Scenario analyses for applications in hydrology and drought vulnerability analysis. Two training courses have been developed in Chile and Colombia with participants from Chile, Bolivia, Peru, Colombia, Argentina, Costa Rica, Honduras and Ecuador. This enables the development of a set of pilot basin case studies in the region that identify their exposure of climate change on hydrometeorological parameters. Finally, this will support the determination of the vulnerability to expected climate change impacts on water resources in pilot basins in the region.

## ASSESSMENT OF WATER RESOURCES AVAILABILITY UNDER DIFFERENT CLIMATE SCENARIOS

The goal of this activity is to support adaptation to climate change in the Region of Latin America and the Caribbean through an increased awareness on the impact of climate change on water resources. This enables stakeholders to define strategies to adapt to expected changes in water resources under the new climate scenarios.

These strategies will focus on three areas for action: water shortage (drought), excess rainfall and/or increase in the frequency of extreme events (floods).

## TRAINING COURSES FOR PROFESSIONALS AND DECISION MAKERS IN LAC

Training courses have been organised to reinforce professional and technical capacity building for the analysis of surface and underground water systems in semi-arid environments and basins.



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The first «Training Institute on Adaptive Management of Water Resources under Climate Change in Vulnerable River Basins» was held in La Serena, Chile, from 8-17 October, 2012. It explored the increasing pressures on water resources, especially in arid and semi-arid regions, climate change, hydroclimatic variability, population growth, urbanization, rising demands for food, societal vulnerability and ecosystem water needs.

A second “Training Institute on Adaptive Water-Energy Management in the Arid Americas” was held on June 24 - July 3, 2013 in La Serena, Chile. The training involved advanced conceptual and practical training by international experts in the use and adoption of tools to address linkages between water resources and conventional and non-conventional energy, and interdisciplinary physical and social science approaches to water and energy joint management.

A similar course on water management using remote sensing applications is foreseen in 2015.

### LATIN AMERICAN SCHOOL OF SOIL PHYSICS-ELAFIS

The Latin American School of Soil Physics-ELAFIS is organised by the University of Ghent with support from the Universidad Central de Venezuela and the collaboration of the Water Center for Arid and

Semi-Arid Zones in Latin America and the Caribbean (CAZALAC). The classes held in 2012 in Colombia and in Peru in 2015 focussed on soil water management strategies for drought management in Latin America and the Caribbean.

More than sixty professionals in Latin America were trained in the field of soil physics and soil conservation to increase water conservation. The objective is to strengthen drought research capacities regarding drought mitigation by applying improved adaptive soil management practices.

### SOIL AND WATER MANAGEMENT OF DEFICIT IRRIGATED PRODUCTION SYSTEMS IN THE BOLIVIAN ALTIPLANO AND GOSWAND FOCUS GROUP

The objective of this activity is to support the development of deficit irrigation strategies, improve soil fertility and water conservation in the quinoa production systems in the Andean Countries. An agro-climatically based manual for deficit irrigation was developed to increase the crop per drop in water-stressed areas. Specific outreach to local farmer communities is ongoing in drought prone areas of Bolivia, Peru and Chile, with support from the COSWAND focus group.